THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

074 CARPENTRY AND JOINERY

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 2014**

Instructions

1. This paper consists of sections A, B and C with total of fifteen questions

2. Answer all questions in section A and B, and two questions in section C.

1. (i) In order to give a screw start, the best tool to use would be a
A. Jennings bit
B. Centre punch
C. Gimlet
D. Bradawl

The correct answer is C. Gimlet. A gimlet is a hand tool with a spiral tip used to create small pilot holes in wood, making it easier to insert screws without splitting the material.

(ii) The layer on which the growth of the tree takes place is
A. Cambium
B. Bark
C. Pith
D. Sapwood

The correct answer is A. Cambium. The cambium is a thin layer of actively dividing cells located between the bark and the wood. It is responsible for the production of new xylem and phloem cells, facilitating tree growth.

(iii) The method of applying timber preservatives that attains the deepest penetration is
A. Spraying
B. Pressure impregnation
C. Dipping
D. Brushing

The correct answer is B. Pressure impregnation. This method involves forcing preservatives deep into the timber under high pressure, ensuring long-lasting protection against decay, insects, and fungi.

(iv) Which among the following are the five operations that must be carried out when preparing sawn timber?
A. Planing to thickness, width, face side and face edge
B. Planing the face side, face edge, width and thickness
C. Planing the face side, width, thickness and the face edge
D. Planing the face edge, face side, thickness and width
E. Planing to width, thickness, face side and face edge

The correct answer is C. Planing the face side, width, thickness, and the face edge. These steps ensure that the timber is accurately dimensioned, straight, and smooth before use in construction or furniture making.

(v) The following are the characteristics of hard wood except
A. Broad leaves
B. Wood is coarse and hard

C. White and rounded crowns
D. Leaves are shed in seasons
E. An irregular, less cylindrical trunk

The correct answer is C. White and rounded crowns. Hardwood trees typically have darker foliage and irregular crown shapes, as opposed to softwood trees, which often have symmetrical conical crowns.

(vi) When eradicating an attack of dry rot, all affected timber should be
A. Replaced and immediately burnt
B. Left in place and treated with preservatives
C. Removed and placed in a ventilated room
D. Dipped in chemicals and returned to the structure
E. Taped in a black plastic sheet to starve fungi

The correct answer is A. Replaced and immediately burnt. Dry rot is a fungal infection that weakens timber, making it structurally unsafe. The best remedy is to remove and destroy the affected wood to prevent further spread.

(vii) Which among the following is the most suitable glue when working with timber engineering and marine works?
A. Animal glue
B. Hot melt glue
C. Contact glue
D. Non-reversible formaldehyde
E. Polyvinyl acetate

The correct answer is D. Non-reversible formaldehyde. This adhesive provides a strong, waterproof bond, making it ideal for marine applications and heavy-duty timber engineering.

(viii) When ordering screws, it is necessary to state the quantity required, net gross amount
A. 100 screws
B. 75 screws
C. 144 screws
D. 150 screws
E. 133 screws

The correct answer is C. 144 screws. Screws are commonly packaged and sold in bulk units called gross (one gross equals 144 pieces).

(ix) What is the function of pigments in paints?
A. Provide the opaque and colour
B. Regulate the penetration
C. Increase the drying speed
D. Provide the suspension
E. Preserve and protect the work

The correct answer is A. Provide the opaque and colour. Pigments are responsible for the color and opacity of paint, allowing it to cover surfaces effectively.

(x) A moulding which covers the joint between the ceiling material and wall is called
A. Struts
B. Battens
C. Cornice
D. Noggins
E. Architrave

The correct answer is C. Cornice. A cornice is a decorative moulding installed at the junction of walls and ceilings to conceal joints and enhance aesthetic appeal.

3. Match the items in List A with the responses in List B by writing a letter of the correct response beside the item number in the answer booklet provided.

List A
(i) An opening in the bottom of the plane
(ii) A plate of steel with a sharpened edge which cuts the wood
(iii) It holds the blade down firmly to the body of the plane
(iv) Controls how far the blade extends
(v) Thumb on the front of the plane
(vi) Serves to curl and break apart wood shavings
(vii) Handle on the rear of the plane
(viii) Metal wedge that holds the blade at the proper angle
(ix) Controls the blade by skewing it so that the depth of cut is uniform
(x) The bottom of the plane

List B
A. Cap iron
B. Depth adjustment knob
C. Frog
D. Lateral adjustment lever
E. Lever cap
F. Knob
G. Mouth

H. Sole
I. Tote
J. Slots
K. Body
L. Shoe
M. Ferrule
N. Hole

Answers:
(i) N. Hole
(ii) A. Cap iron
(iii) E. Lever cap
(iv) B. Depth adjustment knob
(v) F. Knob
(vi) J. Slots
(vii) I. Tote
(viii) C. Frog
(ix) D. Lateral adjustment lever
(x) H. Sole

5. (a) Give the meaning of the term "geometrical tools".

Geometrical tools are precision instruments used in drafting, carpentry, and construction to measure, mark, and create accurate geometric shapes and dimensions. These tools include rulers, compasses, protractors, set squares, and dividers, all essential for ensuring precision in woodworking, metalworking, and technical drawing.

(b) Explain why it is not advisable to plane a surface of wood that has been sanded with an abrasive paper.

i. Sanding with abrasive paper embeds fine particles into the wood surface, which can dull the plane blade and reduce its efficiency.
ii. The smooth surface created by sanding may cause the plane to skid rather than cut effectively.
iii. Sanding changes the wood fibers' orientation, making it harder for the plane to remove material uniformly.
iv. The friction from planing over sanded wood can generate heat, causing burn marks and an uneven finish.

6. (a) How can the capacity (Watt) of the power hand router be determined?

i. The wattage of a power hand router is determined by the formula:

Power (W) = Voltage (V) × Current (A)

ii. The manufacturer specifies the router’s capacity on the machine label, including input and output power.

iii. Higher wattage routers are more powerful and suitable for heavy-duty tasks, while lower wattage routers are used for fine woodworking.
iv. The power rating is also influenced by motor efficiency, load capacity, and the type of material being routed.

(b) Explain how a rip saw can be identified and state when it is used.

i. A rip saw has fewer but larger teeth designed to cut along the grain of the wood.
ii. The teeth are chisel-shaped with a flat profile, making them efficient in removing material.
iii. It is used in carpentry and sawmill operations to cut timber into boards along its natural grain direction.
iv. A rip saw is preferred over a crosscut saw for longitudinal cutting as it provides faster and cleaner cuts with minimal wood tear-out.

7. (a) Define the term "cornice".

A cornice is a decorative moulding installed at the junction of a wall and ceiling. It serves both aesthetic and functional purposes, concealing imperfections and enhancing the interior design of a building. Cornices can be made from plaster, wood, or polystyrene, depending on the architectural style.

(b) What type of joint will be suitable for the construction of the following parts of a carcass?

i. The top (if the end grains are not to be shown) – A mitre joint is suitable because it conceals the end grains and provides a seamless, aesthetically pleasing finish.
ii. The bottom – A dovetail joint is preferred due to its strength and resistance to pulling forces, making it ideal for supporting weight.
iii. Shelves and partitions – A housing joint is the best choice as it provides strong support by fitting one piece of wood into a groove cut in another.

8. Mention four ironmongery which are needed for a side-hung casement window.

i. Hinges – Allow the window to pivot open and closed smoothly.
ii. Casement stays – Hold the window open at different angles for ventilation.
iii. Casement fasteners – Secure the window in a closed position.
iv. Weather seals – Prevent air and water infiltration for energy efficiency.

9. (a) What makes the scaffold stable?

i. A solid and level base ensures that the scaffold stands firmly without tilting.
ii. Diagonal bracing prevents lateral movement and adds structural strength.
iii. The proper distribution of weight across all supports reduces the risk of collapse.
iv. Guardrails and stabilizers enhance safety by preventing tipping and ensuring worker stability.

(b) Why is steel tubular scaffolding preferred to timber scaffolding?

i. Steel scaffolding is more durable and resistant to environmental factors such as moisture and pests.
ii. It has a higher load-bearing capacity compared to timber scaffolding.
iii. Steel scaffolding is reusable and can be quickly assembled and dismantled.
iv. It provides better stability and flexibility in construction projects, allowing for greater heights and complex designs.

10. (a) What is the difference between a gambrel roof and a gable roof?

i. A gambrel roof has two slopes on each side, with the lower slope steeper than the upper one, providing extra attic space.
ii. A gable roof has a single slope on each side, forming a triangular shape, making it simpler and cost-effective.
iii. Gambrel roofs are commonly used in barns and Dutch colonial homes, while gable roofs are common in residential buildings.
iv. A gable roof is better suited for areas with heavy snowfall, as it allows snow to slide off easily, whereas a gambrel roof maximizes interior space.

(b) Why does a flat roof need a slight slope? State its minimum pitch.

i. A flat roof requires a slight slope to allow rainwater drainage and prevent water accumulation.
ii. The minimum pitch for a flat roof is typically 1:40 (approximately 1.5 degrees) to ensure proper runoff.
iii. Without a slope, water pooling can lead to structural damage, leaks, and premature roof failure.
iv. The slope can be achieved through tapered insulation or adjusting the roof's structural framework.

11. In what conditions is shoring provided?

i. When excavating deep trenches near existing buildings to prevent soil collapse.
ii. During the construction of basements to support retaining walls.
iii. When old or weak structures require temporary reinforcement before repairs.
iv. In unstable soil conditions where lateral pressure needs to be controlled.

12. (a) Mention the most common faults in designing a stairway which can cause accidents at home.

i. Inconsistent riser heights lead to tripping hazards.
ii. Insufficient stair width reduces accessibility and comfort.
iii. Lack of handrails increases the risk of falls.
iv. Poor lighting creates visibility issues, especially in dark areas.

(b) Explain the use of a spiral stair in buildings.

i. Spiral stairs save space, making them ideal for small apartments, lofts, and compact homes.

ii. They add architectural appeal to buildings, enhancing aesthetics.
iii. Spiral staircases are often used as secondary or emergency exits in buildings.
iv. They provide access to multiple floors in industrial and commercial settings where space constraints exist.

13. (a) What are the allowances for bench work?

i. Allowances in bench work refer to the extra material added to compensate for machining, finishing, and fitting.
ii. Different types of allowances include shrinkage allowance, machining allowance, and assembly allowance.
iii. Allowances ensure that workpieces are not undersized after final processing.
iv. Proper allowances reduce material waste and improve the accuracy of woodworking projects.

(b) State the use of the following tools.

i. Try square – Used for checking and marking right angles on wood.
ii. Pincer – Used for pulling out nails and gripping small objects.

(c) Make nine classifications of woodworking hand tools and give an example for each.

i. Measuring tools – Tape measure
ii. Marking tools – Marking gauge
iii. Cutting tools – Hand saw
iv. Shaping tools – Chisels
v. Fastening tools – Hammer
vi. Clamping tools – C-clamps
vii. Boring tools – Hand drill
viii. Finishing tools – Sandpaper
ix. Holding tools – Workbench

(d) Name the three planes which are commonly known as bench planes and state the typical use for each.

i. Jack plane – Used for rough shaping and dimensioning wood.
ii. Smoothing plane – Used for fine finishing and removing tool marks.
iii. Block plane – Used for trimming end grains and small adjustments.

14. (c) Mention three functions of a haunch in a haunched mortise and tenon joint.

i. Prevents twisting and distortion – The haunch strengthens the joint by preventing lateral movement and keeping the tenon securely in place.
ii. Increases joint strength – The haunch provides additional surface area for glue adhesion, enhancing the joint's durability.

iii. Improves load distribution – It helps distribute loads more evenly, reducing stress on the tenon and mortise connection.

(d) Give two advantages of a tapped joint.
i. Allows for easy disassembly – A tapped joint enables easy removal and replacement of components without causing damage.
ii. Provides a strong and precise connection – The internal threading ensures a secure fit between components, reducing looseness and enhancing stability.

15. (a) Make an isometric drawing of a lintel formwork and indicate the following parts:

i. Side board – These are vertical boards placed on the sides of the lintel to create the mould for pouring concrete.
ii. Head tree – A structural component used to support the weight of the lintel formwork, keeping it in position.
iii. Props – Vertical or inclined supports used to hold the formwork in place and provide temporary stability.
iv. Ties – These are used to hold the side boards together, preventing them from spreading under the pressure of wet concrete.
v. Cleats – Small wooden blocks fixed onto the side boards to help secure them and prevent movement.
vi. Struts – Diagonal bracing members that reinforce the formwork and prevent collapse.
vii. Soffit board – The horizontal bottom panel that forms the base of the lintel and supports the poured concrete.

(b) Briefly explain seven factors which are necessary when designing windows in a room.

i. Natural lighting – Windows should be positioned to maximize daylight entry while minimizing glare, reducing the need for artificial lighting.
ii. Ventilation – Proper window placement allows for air circulation, improving indoor air quality and reducing moisture buildup.
iii. Orientation – The direction of the window affects energy efficiency. North-facing windows receive consistent daylight, while south-facing ones gain more heat.
iv. Size and proportion – The size of the window should be appropriate for the room, ensuring adequate lighting and ventilation without excessive heat loss.
v. Security considerations – Windows should be made of strong materials, fitted with locks or grills to prevent unauthorized entry.
vi. Aesthetic appeal – The design of windows should complement the building's architectural style and enhance the visual appeal of the room.
vii. Energy efficiency – Windows should be designed to minimize heat loss during winter and reduce heat gain during summer, using double glazing or thermal insulation.

(c) Calculate the number of square meters of match boarding required to cover both sides of a partition 2.40 m high by 2.28 m long, allowing 5 percent extra for waste and cutting.

First, calculate the area of one side of the partition:
Area = Height × Length
= 2.40 m × 2.28 m
= 5.472 m²

Since both sides need to be covered, multiply by 2:
Total area before waste = 5.472 m² × 2
= 10.944 m²

Now, add 5 percent for waste and cutting:
Waste allowance = 10.944 × 0.05
= 0.5472 m²

Total area required = 10.944 + 0.5472
= 11.4912 m²

Rounding to two decimal places, the total match boarding required is 11.49 m².

(d) How many running meters of match board are required for the partition in 15(c) above, if the match boards have a covering width of 92 mm?

Convert the width from millimeters to meters:
92 mm = 92 ÷ 1000
= 0.092 m
Now, calculate the total number of running meters:
Running meters = Total area required ÷ Board width
= 11.49 m² ÷ 0.092 m
= 124.89 m

Rounding to two decimal places, the total running meters of match board required is 124.89 m.